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Guided Exploration: Windowfarm and Hydroponics

Class overview and lesson rationale: This lesson is designed for a 30-student ICT class in the fourth grade. Students at my school have been exposed to themes of sustainability from an early age. The fourth grade science curriculum focuses around water, coming at the question of water from many different angles (such as "using water for transportation" and "using water to do work"). Students actually spend very little time in the fourth grade thinking about water and plants. For this reason, I am installing a hydroponic windowfarm in the classroom. Students will be responsible for caring for the windowfarm plants as well as our standard potted plants. This initial lesson at the start of the school year will be part of getting to know our classroom and its sustainability features.

Lesson objective: Students will develop theories about how the windowfarm works to meet plants' needs, and brainstorm the pros and cons of hydroponic windowfarms vs. traditional potted plants.

Standards for the Student: Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)
Standards for the Teacher: To engage students through student-centered activities that allow choice and cooperative exploration of the content (3C).

Lesson Activities

Connection: In our classroom we are trying out a new-to-us form of gardening called Aquaponics. This is part of our Green Team projects! Today you will be thinking about what might be "green" or "sustainable" about this Aquaponic Windowfarm as opposed to traditional potted plants that most classrooms have (we also have some of those!).

Guided Observation:
Students will be split into two groups. After ten minutes in a group they will rotate to the other group.
The first group will start clustered around the aquaponic windowfarm. Using blank paper on a clipboard, they will sketch the different parts of the windowfarm and try to label them with how they think each part works.
The second group will start clustered around our potted plants. Using blank paper on a clipboard, they will sketch the potted plant and try to label different parts of the sketch (for example, the terracotta pot, or the little dish underneath that gathers the water) with how they think each part works.

Minilesson/Discussion:
"How do you think the aquaponic windowfarm works? What different parts do you see? What does each part do?" Ask students to share out their theories about how the aquaponic windowfarm works. On the smartboard, display an illustration of an aquaponic windowfarm. As students suggest theories about the role of particular parts of the windowfarm, point to those parts and label them on the smartboard with the students' words. Ask students to defend their thinking and ask their classmates to add on or push their thinking.

What do you think are the pros and cons of these two ways of growing plants? You will work in groups of 4 to come up with a chart of your ideas:

Aquaponic windowfarm pros	Aquaponic windowfarm cons
Potted plant pros	Potted plant cons

Give students 7 minutes to work on their charts in groups. Then share.

Closing:
Show students the video Hydroponics to explain more fully how hydroponics works. Then answer any questions the students may still have about the windowfarm. Finally, ask students what they would like to add to their charts now that they have seen the video and learned a bit more about the aquaponic windowfarm.

Rubric

	Needs Support	Developing	Got It
Discussion	Provided minimal ideas during group discussion, or did not appear to be listening to classmates	Actively participated in group discussions with ideas that were on topic, or by actively listening to others and then incorporating their ideas during work time	Actively participated in group discussion with unique ideas that furthered the conversation, may have challenged or built on others' ideas
Guided Observation Sketches	Initial sketches showed only cursory attempt to represent the two growing methods used in the classroom. Sketches may have been incomplete or unlabeled.	Initial sketches showed some attempt to to represent the two growing methods used in the classroom. Sketches were detailed and fully labeled.	Initial sketches showed thoughtful attempt to represent the two growing methods used in the classroom and to think about the purpose of each component of the method. Sketches are detailed and labeled in a way that shows understanding.
Group Charts - pros and cons	Group chart is the work of one or two children as opposed to the whole group OR Group chart is incomplete and does not show deep thinking about the pros and cons of the two methods.	Group chart is the work of the whole group. Group chart is complete and shows thinking about the pros and cons of the two methods, though it may not fully connect these pros and cons to the question of sustainability.	Group chart is the work of the whole group. Group chart is complete and shows deep thinking about the pros and cons of the two methods, and it connect these pros and cons to the question of sustainability.